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USSR Report

CONSTRUCTION AND EQUIPMENT

No. 35

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CONSTRUCTION

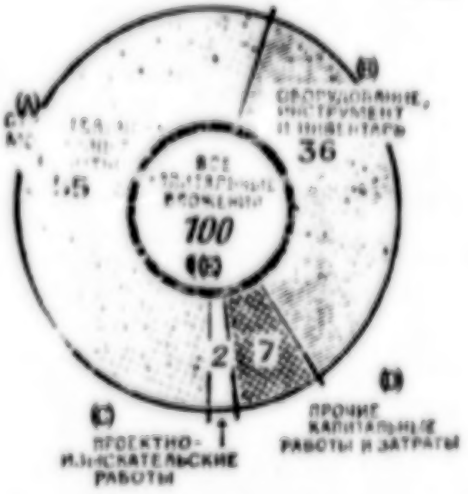
SIGNIFICANT CONSTRUCTION STATISTICS CITED

Moscow EKONOMICHESKAYA GAZETA in Russian No 5, 1981 p 2

[Article: "Facts and Figures"]

[Text] A large detachment of wageworkers and specialists is toiling in construction work. In 1979 the total number employed in this branch was 11.5 million people, including 9 million wageworkers.

* * *



Key:

A. Construction and installing operations--55 percent.
B. Equipment, tools and implements--36 percent.
C. Design and surveying operations--2 percent.
D. Other capital operations and expenditures--7 percent.
E. All capital investment--100 percent.

The Structure of Capital Investment
(in percents of the total)

As is evident from the chart, the share of construction and installing work in the capital investment structure was 55 percent for 1976-1979, and for equipment, tools and implements it was 36 percent. Under the plan for 1981 the share of expenditures for equipment will be raised to 39 percent.

* * *

Capital investment, through all financing sources, was 133.5 billion rubles in 1980. About 22 billion rubles were invested in reequipment and reconstruction. In 1981 capital investment will total 140.2 billion rubles, of which 124.1 billion will be state capital investment.

* * *

In 1981 the builders should provide for the introduction of capacity for mining 6.9 million tons of coal and 12.5 million tons of iron ore and for producing 1.1 million tons of steel and 3.2 million tons of standard equivalent units of mineral fertilizer. Capacity for generating about 10 million kilowatts is to be put into operation at turbine electric-power stations. (The first issue of this newspaper told about the 1981 program for facilities due for startup.)

* * *

The 1981 plan calls for putting into use general-education schools for 1.04 million pupils, preschool institutions for 628,000 children and hospitals rated at 57,400 beds.

* * *

The amount of fully prefabricated construction during 1981 should be 39.9 percent of the total amount of construction and installing work, and of that amount the share of large-panel and three-dimensional module housing in the total area thereof introduced into operation will reach 54 percent.

* * *

It is planned that 7,732 single-bucket and 395 multiple-bucket excavators, 369 self-propelled scrapers, 1,055 motor graders, 6,430 truck cranes, 2,087 erecting cranes, 1,572 tower cranes and large amounts of other equipment will be sent to construction organizations in 1981.

The Availability of Construction Machinery to Construction Work
(at the end of the year, thousands of units)

	1970	1975	1979
Excavators	103.3	140.3	160.5
Scrapers	29.2	41.1	43.5
Bulldozers	101.7	141.7	160.8
Cranes, mobile	118.8	166.6	202.6

* * *

Average labor expenditure for housing construction combines is 20-22 manhours per square meter of total housing space. But expenditures in advanced DSK's [housing construction combines], such as those of Tallinn, Gatchina and Alma-Ata, which operate under brigade contract and use existing capacity completely, do not exceed 13 manhours. If the example of the advanced collectives were to be followed at all combines it would be possible to release up to 82,000 people for other work.

* * *

As a result of the wide introduction of standard sets of equipment for small-scale mechanization and of mechanized tools and attachments at Lithuanian SSR Minstroy [Ministry of Construction] jobs, the output per person per shift is 1.9 m^3 for masonry work, 3.9 m^3 for concrete work, 22 m^2 for plastering, 32 m^2 for painting and 250 m^2 for roofing work, which are much higher than the corresponding average indicators for the branch as a whole.

CONSTRUCTION

WAYS TO CARRY OUT 1981-1985 CAPITAL CONSTRUCTION PLAN DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 5, 1981 p 2

[Article: "Capital Construction"]

[Text] At all stages of development of the national economy, the party and the government have paid great attention to capital construction questions. A high-capacity construction industry equipped with highly productive machines and mechanisms that has at its disposal skilled worker cadres has been created in the country. The amount of capital investment in the national economy these days is almost three-fold that of all the years of the prewar five-year plans.

Vast amounts of capital operations were performed during the Tenth Five-Year Plan. Investment in developing branches of the national economy was 635 billion rubles. Fixed capital increased 1.4-fold. Productive capacity rose in all branches of the national economy. The country's defensive might increased. The construction of housing and cultural and personal-amenity facilities proceeded at a rapid pace.

The CPSU Central Committee's draft for the 26th party congress, "The Main Directions for Economic and Social Development of the USSR During 1981-1985 and During the Period up to 1990," sets the task of raising capital construction effectiveness. The rate of growth of capital investment volume for the 11th Five-Year Plan is planned to be lower than for the 10th. At the same time, large growth in national income is to be obtained.

During the 11th Five-Year Plan 711-730 billion rubles are to be devoted to development of the national economy. The builders' main attention is focused on improving qualitative indicators, the timely introduction into operation of production capacity and facilities, and reductions in construction time and in the amounts of uncompleted construction. Because of this, it is necessary to improve radically the organization of construction, to concentrate capital investment and material resources on the most important jobs, to restrict the number of facilities being erected simultaneously, and to introduce jobs into operation uniformly during the year. It has been possible recently to stop the growth of and to make a relative reduction in uncompleted construction. At the start of 1981 its volume was 89 percent of the total amount of annual capital investment vs 91 percent during 1979. The task of bringing the amount of uncompleted construction down to the norm has been set for the current five-year plan.

The trend in capital investment is being changed considerably. Investment is increasing substantially in the fuel and energy branches and in industries that

support the pace of technical progress. In the processing branches of industry, capital investment is directed primarily to the reconstruction and reequipping of enterprises.

New enterprises will be built primarily in industries and at production facilities that provide for progressive shifts in the structure of social production and for bringing the fuel, energy, mineral and raw-material resources of the eastern and northern parts of the country into the economic turnover. As before, the construction of housing and cultural and personal-amenity facilities is to proceed at a rapid pace. Much work is to be done by rural builders in the erection of facilities for production purposes and of housing and amenities for communities.

For purposes of carrying out this majestic program, the CPSU Central Committee's draft calls for labor productivity in construction to increase by 15-17 percent. All increases in the amount of work done during the forthcoming five-year plan must be carried out without an increase in the branch's worker manning.

A speedup of introduction of scientific and technical achievements has the main role in raising the effectiveness of construction work and in successfully fulfilling the construction program. And so it is necessary to increase the use of general-purpose industrial buildings and structures based upon the use of lightweight structure. These types of buildings are being made by modern industrial enterprises. They have a high degree of factory preparation and are delivered to the job site in a complete set and are assembled rapidly.

USSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work] is establishing production associations that will produce, deliver and assemble industrial buildings that are made up of outfitted structures that incorporate a high degree of factory manufacture. The capacity of enterprises that produce lightweight structure has reached an amount that will permit up to 8 million square meters of industrial-building space to be introduced during the year. An expansion in the practical use of this structure will depend completely upon clients and design institutes.

In construction an intensification of production is realized through the further development of industrialization. The manufacture of parts of buildings and structures must be transferred to highly mechanized and automated departments of factories, while at the job sites only assembly operations are to be carried out; this will lead to substantial savings of labor. A reduction of on-site expenditures by just 1 percent will enable an additional billion rubles' worth of work to be performed.

Industrialized methods of construction will enable on-site construction time to be sharply reduced. Thanks to the fact, for example, that Moscow's builders use articles with a high degree of factory manufacture, labor costs for erecting housing are lowest in Moscow. If all the country's housing builders had indicators at the level achieved by the Muscovites, each year it would be possible to erect an additional 10 million square meters of housing, for 300,000 families.

The draft of the "Main Directions" emphasizes especially the necessity to increase the responsibility of ministries, agencies, consultant organs and design, development and scientific-research organizations for providing for a high technical and economic level of design solutions and for correct determination of budget-estimated costs of construction.

The new five-year plan sets the task of providing for the construction of new enterprises within, as a rule, industrial clusters that have common facilities for auxiliary production and activities and for engineering structures and service and utility lines. It is necessary to develop and apply the principle of cooperation not only for utilities and service lines and auxiliary production but also of cooperation of the facilities of main significance of enterprises of neighboring branches of the national economy.

Ministries and agencies should carefully analyze mistakes that have been committed in consultants' work and apply urgent measures to improve the quality of departmental consultants' review. The technical and economic level of the designs that arrive at the construction project, the labor intensiveness of the construction work and, consequently, the time needed to execute construction depends greatly upon this.

It is important in this connection to recall the valuable experience of the consultants' bureau and the improvement in design solutions of Glavzapstroy [Main Administration for Construction in the Western Economic Region], which has made an important contribution to the refinement of designs in accordance with the newest achievements of science and technology.

The use of standard designs and unified solutions is important in developing industrialized methods. However, for some reason there is a striving in many cases to prepare technical documentation for each new enterprise without taking the repeat use thereof into account. Thus bakeries, dairies and meat combines often are built according to individual designs; this, it stands to reason, does not help to reduce labor costs or to accelerate the construction of facilities.

The large-scale introduction of progressive organizational and technological solutions in construction should be provided by technological design institutes and orgtekhstroys [state trusts for industrialized construction] which are called upon to improve the organization of construction work and to introduce scientific and technical achievements into practice. Each ministry and each main administration has the capability to use orgtekhstroy forces that are directly assigned.

One of the main areas for improving construction organization during the 11th Five-Year Plan should be the development of construction methods that involve the use of flow lines for components and complete modules and rotating-duty and expeditionary methods of construction. These progressive methods, which enable the most complicated facilities to be built economically in brief periods and at a high organizational level, have been born by the operating practice of the country's advanced collectives.

Construction experience demonstrates graphically that a main reserve for raising labor productivity in low-level collectives is the brigade contract. According to estimates, each million rubles' worth of construction and installing work performed by this method saves the labor of 12 people.

The experience of advanced brigades must be used actively. For the country as a whole, output in in-kind indicators per worker of such brigades is 20-25 percent higher at identical facilities than the average for all brigades. There is one conclusion from this: if we are able to use advanced-brigade work experience widely at construction projects, it will be possible to achieve a substantial increase in labor productivity in construction at minimum cost and in a short time.

A promising area for raising construction-work effectiveness is conversion to the planning of supply and equipment resources and to making up completely outfitted sets directly at the brigade in accordance with the example of Vinnitspromstroy [Vinnitsa Industrial Construction Combine] of USSR Minpromstroy [Ministry of Industrial Construction]. The use of this experience is a reliable basis for solving the tasks set in the draft of the "Main Directions"--to create conditions for the dissemination everywhere of the start-to-finish flow-line brigade contract, based upon a raising of the levels of engineering preparation and of industrial-production outfitting.

The brigades that operate under contract did more than 37 percent of the total work volume during 1980. In 1981 this share will exceed 40 percent, and by the end of the five-year plan it should reach 60 percent.

Advanced experience in management should be made the property of all enterprises and organizations. Use of the advanced experience that has been gained, the training of supervisory personnel on the basis of advanced collectives, and the gradual introduction of what has been assimilated should be the center of attention of construction-project party organizations and an important element of their organizational activity. Thus the experience of Glavvostoksibstroy [Main Administration for Construction in East Siberia] of USSR Minpromstroy in improving the system of organizational and technical preparation for construction jobs deserves to be disseminated in every possible way.

It is planned during the 11th Five-Year Plan to take steps to greatly reduce manual labor expenditure in construction, to equip construction organizations with highly productive machines and mechanisms and automotive transport, and to improve the use thereof through the increased use of shift work. Output of the complex of machinery for doing construction work under actual production conditions is to be expanded. The supplying of construction organizations with equipment for small-scale mechanization and with powered tools and hand tools is to be improved.

The nationwide socialist competition for successful fulfillment of 11th Five-Year Plan tasks that is being promoted is engendering valuable new initiatives. Many builders' collectives are organizing socialist competition under the principle, "The Workers' Relay Race." This initiative, which the CPSU Central Committee has approved, found support during the construction of 700 large facilities, including, for example, Atommash, the Soligorsk Potassium Combine and the Novolipetsk Metallurgical Plant. Competition at the Rostovites' initiative under the slogans, "Not One Lagging Rank," and "We Will Build Ahead of Time--We Will Assimilate Ahead of Time," and at the initiative of Moscow Oblast builders under the slogan, "High Production Sophistication and Work Organization at Each Workplace," and other competitions, are being expanded.

The influence of economic methods on final construction-work results will be intensified during the new five-year plan.

Everything necessary for successful execution of the enormous tasks that have been assigned for the 11th Five-Year Plan exists. It is a matter of exerting organizational capabilities, taking energetic and purposeful action, and giving wide scope to socialist competition. The party is expecting a greater yield from capital investment, a great contribution by builders to the development of material production, and a rise in the effectiveness thereof, all of which should promote a further rise in the living standard of the Soviet people.

11409
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CONSTRUCTION

BUILDERS EXHORTED TO MEET 11TH FIVE-YEAR PLAN

Moscow PRAVDA in Russian 26 Mar 81 p 1

[Editorial: "The Builders' Five-Year Plan"]

[Text] Each day more than 10 million people are busy at their work places at construction projects. They are erecting new housing, factories and electric-power stations and laying roads, canals and oil and gas pipelines. Their contribution to the growth of the country's economic potential and the people's welfare is extremely important. Let us recall: during the Tenth Five-Year Plan alone more than 1,200 large industrial enterprises and 530 million square meters of housing were built.

At the 26th party congress Comrade L. I. Brezhnev called the 11th Five-Year Plan an important examination for construction workers: "Its characteristic feature is a concentration of effort in every possible way on the most rapid completion and startup of those enterprises that are capable of supporting the greatest growth of output and of ripping out bottlenecks. We have already adopted this policy, and it must be followed strictly."

The party congress defined for the builders a clear and concrete program. Total capital investment in the national economy will be increased by 12-15 percent. Growth will be less than during the preceding five-year plan. However, the yield from each ruble invested is to be more meaningful. The party is aiming at a rise in capital expenditure effectiveness and the rapid recoupment thereof. That is why the reconstruction and reequipping of existing enterprises has been placed on first priority. This, as experience indicates, is the true path to intensive development of the economy, a reduction in the number of newly started construction projects, and a reduction of uncompleted work to the norm. Such a policy for distributing capital investment requires a special approach to standard practices for planning. Here the role of the industrial ministries will grow substantially. Jointly with planning organs, they should develop programs for long-term development of the industries, taking scientific and technical progress into account. Unless this is done, it will be difficult to make up economically substantiated annual plans for reconstruction.

The primacy of reconstruction and reequipping of industry does not at all mean that new construction will cease. However, new enterprises should be built only where the complete utilization and reconstruction of existing enterprises will not be able to satisfy the national economy's needs for a given type of output. This

approach to the matter will enable builders to concentrate forces on the most important facilities and to avoid a frittering away of resources. This year, for example, they are to put into operation large capacity for power engineering, metallurgy, the oil and gas industries and light industry.

Enormous attention is being devoted to the further development and improvement of regional production complexes, especially in the country's east. Rapid implementation of major integrated programs testifies to the great potential of our socialist economy. The Kansk-Achinsk, Bratsk-Ust'-Ilimsk, Pavlodar-Ekibastuz, West Siberian, Sayany and other regional production formations require the close interaction of the builders with branch-of-industry agencies and local party and soviet organs. Intolerance of lopsidedness in the development and maximum utilization of natural resources will mean an increase in the complexes' contribution to the national economy.

Much also is to be done in capital construction in accordance with the CPSU Central Committee and USSR Council of Ministers decree about improving the economic mechanism. The branch will convert to the two-level or three-level system of management. The process of fusing small subunits into large construction and installing associations is going on. The results of the associations' work will be evaluated by the facilities and commodity output that are completed on time and turned over for operation. The whole branch will convert to this system during the 11th Five-Year Plan. USSR Gosplan and the construction ministries must right now, at the start of the journey, achieve a strict balancing of the collectives' tasks with their potential and their supply and equipment resources. The efficacy of the new system of management depends primarily upon this.

The rising scale of capital construction and the turning thereof to the intensive path of development require a substantial rise in the mechanization of operations. Collectives have at their disposal today an adequate amount of high-capacity and powerful technical resources, yet labor productivity is growing slowly. What is the matter? The fact is that many operations--plastering, painting, bricklaying and others--are done manually. The builders need a set of equipment for the whole set of operations. USSR Gosstroy and the Ministry of Construction, Road and Municipal Machine Building must study still more attentively the collectives' needs and aim plants at the production of sets of technical equipment. This, as well as the industrialization of construction work, is the basis for growth of labor productivity in the branch.

Capital construction is the largest consumer of supply and equipment resources. A thrifty attitude toward the national good and rational use of each kilogram of cement, metal and paint is an important indicator of the degree of a collective's maturity. Kalinin wageworkers and specialists spoke about this from the standpoint of the state in their letter, "The Economy Needs Savings," which was published recently in PRAVDA. The letter found a businesslike response among the builders. Party and trade-union committees of trusts, associations and ministries must take charge of the drive for economical and thrifty expenditure of supplies and equipment and make it one of the main areas of socialist competition.

The five-year plan's construction program is complicated and strenuous. Party organs should help collectives to cope with it. In raising the responsibility of supervisors and specialists, they have been called upon to come out decisively against any phenomena of conservatism, sluggishness and parochialism. It is

important to train personnel in party persistence, to strengthen construction subunits with experienced specialists, and to develop collaboration with subcontractors.

The first quarter of the 11th Five-Year Plan is being completed. Many collectives of builders have been working at a rapid pace since the first months of the five-year plan. Using their experience more widely, bringing laggards up to the level of those that are advanced, and introducing facilities into operation more rhythmically are a pledge of successful fulfillment of the five-year plan's construction program and of 26th CPSU Congress decisions.

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BENEFITS OF UNINTERRUPTED PLANNING METHOD DISCUSSED

Moscow STROITEL'NAYA GAZETA in Russian 30 Jan 81 p 1

[Article by A. Grabel'nikov: "The Uninterrupted Planning Method is Order"]

[Text] Orel has occupied first place among the number of cities in the Russian Federation that are successfully building housing and structures for social and cultural purposes for many years now. Nor did 1980 become an exception--Orel construction workers overfulfilled the state plan for all of the principal indices. New residents obtained 124,000 square meters of housing--in the 76th and 77th blocks of Zavod Rayon, in the 178th block of Sovet Rayon and in the 10th microrayon of the steel rolling plant. The local housing construction combine erected three 9-story buildings above the annual program. The fast pace of work of the completely equipped housing construction crews of V. Yefimtsev and N. Burmistrov, as well as the collectives of the 10th construction and installation administration in Orelstroy, which is supervised by foremen N. Dolgov and N. Lukashin, hastened housewarmings for many citizens.

Many social and cultural facilities and preschool institutions have also appeared in new microrayons. In accordance with the two-year planning of construction the second phase of a municipal children's hospital was built.

"Overall, everything was built that was planned within the projected period of time," said Deputy Chairman of the Orel gorispolkom, A. Karatayev. "The system of uninterrupted planning for building housing units and social and culture facilities, well known to all as the Orel 'uninterrupted planning method' and which is already in operation in the city for 10 years, unfailingly helps us in this. With the aid of it one of the most urgent problems of construction has been solved--putting facilities into use at an even pace. In other words, 'the uninterrupted planning method' is strict order at the construction site."

"Our construction workers, as is set down by the directive schedule that is compiled and controlled by the coordinating soviet which was formed under the gorispolkom, complete 25 percent of the annual program every quarter and sometimes even more. Thus, at the end of the year we have no crash or rush work, on the contrary, we meet the annual assignments ahead of schedule. And here we begin the program for the next year--we have, after all, two-year planning."

Continuously on-going construction, supported by a cost-accounting method at the lower levels, made it possible to develop the fast pace of construction. In recent times

several microrayons have sprung up in the city. Each of them was built in three years on the average. Due to the fact that almost 80 percent of the entire volume of housing construction is concentrated in the hands of a single client, building is going on uniformly in all three of Orel's rayons closer to the participating enterprises. The system of uninterrupted planning also helped to form four specialized construction subdivisions, for example, a foundation phase administration and a brick housing construction administration."

Today, Orel construction workers are confidently completing the program for the first quarter of the 11th Five-Year Plan. An efficient smooth pace is their dependable assistant.

9495
CSO: 1821/68

PLASMA INSTALLATION THAT FACES BRICK DEVELOPED

Moscow STROITEL'NAYA GAZETA in Russian 23 Jan 81 p 3

[Article by A. Kozlov: "Plasma Is at Work"]

[Text] It would seem that after millenia people would be well acquainted with the constructional and decorative qualities of brick. But in fact they are not! Ever newer "facets" of it are discovered from time to time.

Gennadiy Georgiyevich Volokitin, manager of the laboratory of the Tomsk Construction-Engineering Institute, places on a table several colored photographs of stacks of brick of practically all colors of the rainbow. "Well, what about it?" asks the skeptic. "Colored brick is not being manufactured for the first time."

This is correct--not for the first time. But not this way. The facing edges of the brick appear to be covered with a glaze. However, this is not glazing.

"We get this after treating it with a plasma, and it is an extremely strong surface," says G. Volokitin.

The technology was developed in 1978 by the Tomsk Construction-Engineering Institute, jointly with the Minsk Institute of Physics of the BSSR Academy of Sciences and the Institute of Heat Physics of the Siberian Division of the USSR Academy of Sciences. In about 1½-2 seconds the brick's surface, on which a pigment has first been applied, is covered with a strong silicate crust.

Brick treated with the plasma has passed the most demanding tests. Its "dossier" contains this data: a freezing resistance of more than 35 cycles (silicate brick has about 25). The brick possesses high impermeability to water and resistance to environmental effects. Its surface is self-cleaning. Its economic effectiveness (in comparison with the facing of buildings with ceramic tile) is more than 200,000 rubles per year. A single installation is capable of treating up to 3 million bricks during this period.

Ceramic tile, concrete slab and certain other building materials can be treated with plasma.

The innovation has interested specialists of Moscow, Chita, Alma-Ata, Belgorod and other cities of the country.

"We are already introducing the technology into practice on a contract basis," says G. Volokitin. "We are readying the first installation at the Tugan Silicate-Brick Plant of Tomskstroymaterialy [Tomsk Building-Materials Association]. It is possible, of course, to introduce several more units this way for treating brick and reinforced-concrete panels. During the 11th Five-Year Plan we propose to carry out, under economic agreements, scientific research on the subject in the amount of 500,000 rubles, to create a stationary industrial-test line for treating panels with plasma and to design a mobile installation for treating completed buildings and structures. But if the innovation is introduced at this pace, the process will be prolonged over many years. It is necessary to treat the problem in integrated fashion: further study of various design solutions for the equipment is needed, production lines must be designed, and so on. The problem will not be solved with a small force, yet our laboratory has only four people...."

The invention of the Tomsk and Minsk scientists is being requested at construction-industry enterprises. But who will undertake to help to bring it to brick and ceramics plants, to enterprises that make prefabricated reinforced concrete and to other enterprises?

Evidently, the one who is closest of all: USSR Minstroymaterialov [Ministry of Construction Materials Industry]. The ministry can and should undertake responsibility for solving this problem and be responsible for introducing plasma treatment into practice.

11409
CSO: 1821/65

INDUCTION PLASMOTRON DEVELOPED, HAS DIVERSE USES

Yerevan KOMMUNIST in Russian 8 Feb 81 p 2

[Article by N. Basina (APN [Novosti Press Agency]): "Plasma's Roles"]

[Text] The All-Union Scientific-Research Institute for High-Frequency Currents imeni V. P. Vologdin (VNIITVCh) has created and tested the most powerful induction plasmotron in domestic and world practice. Its birth has expanded considerably opportunities for the industrial use of plasma technology.

Today plasma has no few operating roles. Installations that cut and weld metal, heat it prior to working, weld steel, melt and spray on various coatings, and do a multitude of other useful things are operating successfully in industry. Even so, industry is showing increased interest in VNIITVCh's latest work on induction plasma, especially in a plasmotron of 1,000 kilowatts power.

The fact is that, unlike the ordinary arc plasma that is being used today in most industrial installations, the plasma that is obtained by the induction method is not contaminated by electrode-combustion products. A second important virtue ensues from the first: since there are no electrodes, that means they do not need to be changed, and the plasma induction installation can operate continuously and for a practically unlimited length of time.

In arc installations, the plasma is compressed into a fine beam and heated to very high temperatures--on the order of several tens of solar temperatures. But the induction plasma is in the "cool" temperature category--its temperature does not exceed 11,000 degrees. But even this "low" temperature is completely adequate for the hottest chemical reactions. Moreover, unlike the arc plasma, the induction plasma burns in the form of a torch, that is, the working space necessary for conducting the reaction exists. All this makes induction-plasma installations indispensable for obtaining superpure chemical compounds, for the thermal treatment of certain metals, and for executing continuous or very lengthy chemical and thermal processes. But these do not by far exhaust the possibilities.

If, for example, a jet of "cool" plasma is passed over a concrete constructional panel, its inexpressive gray surface is transformed into something that is more reminiscent of solidified surf. It is both pleasing to the eye and extremely practicable--a panel "glazed" by plasma is stronger and withstands atmospheric effects better. Moreover, this technology is cheaper than facing panels with ceramic tile. Installations for plasma treatment of concrete panels are being introduced at Leningrad housing-construction enterprises.

Plasmotrons of severals tens of kilowatts of power are being used for such operations. Basically they are suitable for obtaining the most diverse chemical substances, but yield of the product will not be very great. The new plasmotron of 1,000 kilowatts of power permits conversion to high-tonnage production of numerous chemical compounds that are most valuable, for example, titanium dioxide pigment (to make it compl[illegible]ed, the chemists call it ordinary whitewash). Magnesium dioxide--fused magnesium--of a purity that cannot be obtained by ordinary methods can also be obtained by induction plasma. The industrial introduction of plasma technology promises great economic benefit here: fused magnesium is used as an insulating material for tubular electric heaters, and improvement of its characteristics can raise the quality of these devices considerably.

Another most valuable role for the new plasmotron is associated with tungsten. This metal is very "stubborn": it improves its properties only at a temperature of about 2,500 degrees. It is difficult to obtain such a temperature in modern furnaces, and, when this is done, the furnaces endure it for only a short time--they go out of order. The induction plasmotron copes with tungsten without difficulty, it can operate, as has already been said, practically continuously, and the metal is not contaminated by impurities during treatment. Plasma annealing of tungsten filaments for electric-light bulbs increases their service life severalfold.

"Small but precious"--the old saying is recalled in connection with still another possible role of the new plasmotron. The fact is that this small installation, which is about a meter high and about half a meter in diameter, is capable of replacing...the blast furnace. If a hydrogen plasma torch passes through crushed ore, the iron is rid of oxides without the participation of coke, which blast furnaces require in enormous amounts. The byproduct of the plasma process in this case is not carbon dioxide, which blast furnaces poison the air with, but ordinary water. Moreover, a potential for using the poorest iron ores emerges.

"But this does not at all signify the completion of our work," says manager of the institute's Section of High-Frequency Plasma and Dielectrics Igor' Dashkevich. "Right now industries need installations 10 times as powerful. We are seeking out the possibility of reducing the frequency of the feed sources and creating low-frequency plasmotrons. Our installations should be still more productive and economical. Only under these conditions will it be possible to use them on a truly massive scale."

We shall not cease searches for new "roles" for induction plasma. Right now, for example, work is in progress to create an installation for high-frequency spectral analysis.

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CSO: 1821/65

MOLDAVIAN HOUSING BUILDERS USE POLYETHYLENE PIPE FOR WIRING CONDUITS

Moscow STROITEL'NAYA GAZETA in Russian 5 Apr 81 p 2

[Article by M. Oganesyan, manager of Moldelektromontazh [Moldavian Electrical-Equipment Installing Trust] (Kishinev): "Both Quicker and Cheaper"]

[Text] During the 11th Five-Year Plan fully prefabricated construction, primarily large-panel housing construction, will continue to increase. In past years the technology for manufacturing reinforced-concrete structure has been improved over a broad front, but the method for constructing conduits for laying wire for grouped electrical grids invariably remained imperfected.

An increase in large-panel housing construction in Moldavia has set before the Moldelektromontazh collective in all severity the question of introducing new technology for building the conduits in the panels. It was used at one of Kishinev's KPD's [large-panel housing-construction plants]. But in June 1977 the republic's Gosstroy adopted a decision to carry the electrical wiring in plastic pipe and junctions in all series of large-panel housing.

What has this innovation yielded for the national economy? Figures tell the story about this best. The economic benefit just from reducing labor costs was 130,000 rubles.

But the advantages of the new technology are not measured by money alone. With its introduction, the quality of forming the conduits increased sharply and labor sophistication was greatly raised at the KPD's.

This does not exhaust the advantages of the new technology. The use of plastic pipe and junctions enables the conducts to be fully sealed. And the installing process itself is simplified.

Polyethylene pipe is elastic and cheap. Its use not only saves steel pipe but also increases the reliability of the electrical wiring. The less the friction during tightening, the less the damage to the insulation, and, should this occur, the less the danger of short-circuiting. Condensation is not encountered with polyethylene pipe, unlike the case of steel pipe, where condensation combines with ferric oxide and destroys the wire.

In speaking about the advantages of the new techology, one cannot avoid telling about the difficulties that have arisen. Moldavia's local industry today manufactures polymer parts for use, and these are not made, needless to say, from

first-grade raw material. And we receive many inquiries, with requests to send test lots of our polymer articles. Understandably, we are in no position to satisfy these requests, but we hope that in time the manufacture of polymer articles for electrical installation will be centralized and set up on a flow line.

11409
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DEFICIENCIES IN ASHKHABAD HOUSING CONSTRUCTION ANALYZED

Moscow STROITEL'NAYA GAZETA in Russian 30 Jan 81 p 1

[Article by V. Knyazev, TRUD correspondent: "The Price of Errors"]

[Text] More than 3,000 square meters of housing had to be turned over by Ashkhabad construction workers at the end of December in order to cover the annual plan. But this was not able to be done. The rush work affected the quality of work; almost all of the housing units that were presented to the state acceptance committee had a massive amount of deficiencies.

What is the matter? This is how construction workers in SMU [Construction and Installation Administration] No 2 in the Ashkhabad DSK [Housing Construction Combine] explained this.

S. Kotov, foreman of assemblers:

"What kind of pace can there be if we only receive a third of the required panels in a day? Here we are assembling the first floor and we should already be assembling the third."

N. Bunakova, painter and plasterer:

"The panels arrive with broken off edges, they are irregular and don't have window or door frames. They should be plastered at the plant but we are doing this work right at the construction site."

The housing construction combine--the main contractor of the Ashkhabad gorispolkom's UKS [Directorate of Capital Construction]--began operations five years ago. However, the automated line for producing exterior wall panels at the combine was acknowledged to be worthless and was disassembled. The line for supplying concrete is idle. Everywhere where automated operations are specified according to the technology the work is being done by hand. Thus, it is no coincidence that housing construction workers developed only half of the designed capacity of the DSK.

The situation that has come about is explained at the combine and in the republic's Ministry of Construction by a morally obsolete design for the enterprise and massive amounts of errors which were discovered in it. In such a case we may ask who, if not the ministry, accepted and brought to fruition a design that is worthless in principle. At this, they onl, shrug their shoulders.

9495
CSO: 1821/68

DEPUTY MINISTER CITES IMPROVEMENTS IN HOUSING STANDARD

Tallinn SOVETSKAYA ESTONIYA in Russian 15 Jan 81 p 3

[Article by APN [NOVOSTI Press Agency]: "Apartments of the Eighties"]

[Text] During the past 25 years more than 50 million apartments were built in the USSR. The fast pace of building up the fund of available housing--2 million apartments annually on the average--has made it possible for practically every Soviet family to improve their living conditions. Nonetheless during the new five-year plan as well the pace of housing construction, as before, remains fast.

"How can this be explained?" APN correspondent Yevgeniya Gurnova asked Sergey Zmeul, first deputy chairman of the State Committee for Civil Construction and Architecture under USSR Gosstroy.

"The answer to this question," says S. Zmeul, "requires at least a general analysis of what was and what is. At the end of the Great Patriotic War, the Soviet people found themselves with extremely difficult housing conditions. Our country lost almost half of its fund of available housing during the war years; more than six million homes were destroyed. At the time there were many more problems than capabilities for solving them. No one, understandably, expected housing comfort. People understood that settling people by calculating a room per family was a forced measure.

"Having restored the national economy that was disrupted by the war and having formed a powerful housing construction industry we reached the current pace and volumes of housing construction by 1956--two million apartments and detached houses annually. This made it possible to arrive at a solution to a very important problem: settling people according to the principle of an apartment per family.

"At the same time problems of housing quality were also solved. At the beginning of the sixties the housing construction industry completed a transition to building housing according to new designs with improved floor plans for apartments. However, a more substantial improvement in the standard of housing occurred during the seventies when so-called third generation apartments began to be introduced into production everywhere. At present about 60 percent of the housing in the country is being built according to these designs. The selection of apartments is more varied in them (up to 10 types), there is more space for auxiliary areas (corridors, bathroom facilities, kitchens, entrance halls), a veranda instead of the traditional balcony and perfected technical equipment in houses.

"In forming new housing rayons the principle of overall construction is being strictly observed. This means that kindergartens and schools, polyclinics and movie theaters, trade and everyday service enterprises are being built at the same time as housing. A large selection of typical designs for housing and public buildings has made it possible to noticeably improve the exterior appearance of new blocks in our cities.

"At the present time the fast pace of housing, cultural and everyday service construction is creating realistic possibilities of providing each family with a separate comfortable apartment. This goal, as is noted in the draft of the CPSU Central Committee's 'Principal Trends for Economic and Social Growth in the USSR During 1981 to 1985 and for the Period up to 1990' will basically be achieved during the decade that has just begun.

"This, however, does not mean that the population's demand for housing will be completely satisfied. Based on the opinion of demographers and physicians a reasonable level of housing comfort can be achieved with a distribution of housing where the number of rooms in an apartment exceeds the number of family members by one. On the way to achieving this goal we have to realize the principle of a room for each family member. Its practical accomplishment will occur, evidently, during the next decade.

"Now the largest scientific research and design institutes are already working out designs for fourth generation apartments. The space for all living and auxiliary areas is being increased. Floor plans, which are being transformed based on the desires of residents, are finding broad application utilizing movable partitions and duplex apartments (on two levels). In a word a new housing standard for Soviet people is being born today in drawings and models."

"Naturally building such apartments will be more expensive. How will this be reflected in rents for apartments?"

"I think that they will remain the same as they have been since 1928--1 to 1.5 percent and, together with payments for municipal services, 4 to 4.5 percent of the budget of a family with an average income.

"Keeping rents for apartments low is a fundamental policy of the Soviet government which was secured by the USSR Constitution, the first in the world to proclaim the right of a person to housing."

9495
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INERTIA OF 'NUMBERS GAME' DESCRIBED

Minsk ZVYAZDA in Belorussian 18 Jan 81 p 2

[Article by V. Shkutnik, director of the Division of the Construction Industry of the Administration of Capital Construction of the State Planning Commission of the BSSR: "The Inertia of the Numbers Game." Passages enclosed in slantlines printed in boldface.]

[Text] /"To look ahead toward the improvement of performance of invested capital through the application of the findings of scientific and technical progress and of advanced experience, through economizing material and reducing lost work-hours in production... To increase the level of industrialization in construction activity and the degree of plant production of construction components and parts, to broaden the utilization of new efficient construction components."/

(From a proposal of the CPSU Central Committee to the 26th Party Congress)

As is known, the basis of construction is the construction industry--that totality of construction organizations, including enterprises and farm collectives, that supply it with material and technical resources and services. Its strengthening and improvement are an important condition for the fulfillment of plans in capital construction.

The rapid rise of its fixed capital testifies to the high rate of development of the construction industry in the republic. Within the past ten years this fixed capital has grown by a factor of 2.6.

The basic tendencies of scientific and technical progress and of the growth of work efficiency in construction are manifested by further industrialization, which is predicated on the expansion of plant production of structural components, the setting-up of flow-line construction of buildings and structures, and transition to more complete mechanization in construction work.

Growth of productivity and use of precast reinforced concrete provided the opportunity to shorten significantly the time span in the erection of buildings and structures, to increase the efficiency of construction workers, and to decrease the cost of construction and to improve its quality.

However, excessive reliance on traditional precast reinforced concrete also has negative aspects.

For the 120 million cubic meters of concrete that was produced recently in the country, 10 million tons of steel and 40 million tons of cement were used. Requiring such a huge amount of critical material, these construction needs no longer correspond to the level of development of capital construction or to the economizing requirements of the construction industry.

Therefore much effort is being expended in recent times in the country and in the republic to create capacities for the construction of new, more refined, and lightweight structural components, the use of which reduces the production cost of overall work by a factor of from 1.5 to 2 times, while the mass of buildings is reduced from 5 to 8 times.

However there are still many shortcomings in this matter. For example, the light metallic structural components from the Molodechno plant have not been used on a broad scale in construction projects in the republic. The productive use of several other efficient products and structural components is expanding slowly. It is true that construction workers are obligated as a rule to prove to customers and designing institutes the necessity of using efficient structural components. Basically but one factor--the input of metal-- is taken into consideration at this time in making a decision. Frequently the decrease in the overall mass of buildings is not taken into consideration. Nor is the total amount of man-hours of work needed for the construction, or the sharp cut in the time-span of construction. Therefore in our opinion it is appropriate /that the leading institutes of the USSR Gosstroy conduct a systematic analysis of the results of the use of light structural components, along with consideration of the effect this has on the national economy, and that a list be prepared of structures that should be subjected to this process when they are being built/.

It is no secret that buildings with light structural components in many respects are superior to buildings made of traditional materials. As experience testifies, use of the former contributes to earlier entry of enterprises into production and thus provides the opportunity to earn additional returns. Light metal structural components permit the increase in labor productivity by 30 or 40 percent in work dealing with erecting structures and decreases the mass of buildings several times over, which is accompanied by a corresponding decrease in transportation expenditures. Similarly, there is a reduction from 10 to 30 times in the loss of man-hours of work for the producing of partition components and reduction by a factor of from 1.3 to 1.5 for roof-supporting components.

Under the aegis of the Ministry of Rural Construction of the BSSR there was built in Gomel during the ninth five-year plan a plant for the production of 15 thousand cubic meters of glued-wood paneling by imported equipment.

The effectiveness of such structural components resides in their high relative durability and ease of installation. Given equal loads and spanning, wooden support components are five times lighter than reinforced concrete. Consumption of metal for support components amounts to 3 kilograms for one square meter of living space, while for buildings made of precast reinforced concrete the figure can reach 40 kilograms.

Given all of this, nevertheless within recent years difficulties connected with the use of these components have come into existence. The State Committee for Construction Affairs of the BSSR, the Ministry of Agriculture of the BSSR and other customer agencies do not pay proper attention to and interest in their manufacture.

At the same time it would be worthwhile to consider the question of improving these products, having in mind the replacement of glued wooden frames and arches by typical supports, which will permit the cutting of the cost of an individual glued wooden panel by a factor of 1.5 and correspondingly lower the cost of construction.

There is need of planned projects that would permit the substantial lowering of the specific outlay of reinforced concrete in rural construction (that is, of cement and metal) and the broader use of ordinary wood in industrial construction. However, the applicability of wood is greatly limited.

There exists in the republic also some experience in the construction of high buildings using concrete in place, in which the combined inputs of labor and monetary expenditures do not exceed the expenses that are expended in the construction of buildings made completely with the use of precast concrete only.

In the construction in Minsk of several high-rise apartments made with the use of long-lasting ahlaparyta- concrete poured in place, a number of radically new technological approaches were applied. Specifically, all structural components, including single-ply exterior walls, partitions and ceilings are made of ahlaparytabeton. The ceilings were poured with concrete at the same time as the floors were constructed. This method has a number of advantages: sound-proofing is improved, the longevity of the building is increased, and the opportunity is provided to vary the plans of the apartments and to construct apartments of various designs. Further, specific capital investments for the development of the base of the building industry are cut in half.

Much has been done in the republic with respect to the mass production of mechanical erection and specialized construction components, which depends on the capability of plants to produce metallic components, plumbing and ventilation supply centers in Minsk and Mogilev, and associated industrial centers in Gomel, Brest, Mozyr, and elsewhere.

Most enterprises in the construction industry frequently delay or deliver incomplete sets of products, which leads to the interruption of building and construction work and the piling-up at construction sites of excessive parts and material. As inspection results indicate, the actual excess stock of precast reinforced concrete at the building sites of the Ministry of Industrial Construction of the BSSR and of the Ministry of Rural Construction of the BSSR on 1 November of last year exceeded the norm by a factor of 1.6. This situation is the result primarily of the inefficiency of the responsible services of the construction ministries, and of the absence of coordination of work projects at construction sites. Additionally, to a certain degree, the incomplete delivery of structural components is connected with the circumstance that collectives in enterprises tend "to stress numbers" ("tsifrut' val"), a large number of parts are manufactured, but not in the assortments needed. The end product of construction organizations is completed buildings and structures, not structural components and parts manufactured by enterprises in the construction

industry. /Therefore in our view it would be appropriate to turn over to the construction ministries the functions of planning for the manufacture of parts by enterprises subordinated to them along with the transfer of these enterprises to the budget of the construction ministries./ This applies fully also to the housing and rural construction combines because apart from everything else a collective of a combine is interested in increasing plant production of finished units of structural components and parts, and this enables the invested resources to increase the efficiency of production in construction.

9788
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EARTHMOVERS BUILT SPECIALLY AT MINSK DESCRIBED

Moscow IZVESTIYA in Russian 11 Mar 81 p 1

[Article by M. Shimanskiy (Minsk): "Giant Machines"]

[Text] Specially built earthmoving machines created by Minsk's science-and-production association Dormash have been tested successfully.

They stand there like three steel giants. Their interior dimensions testify to the exceptional power and great capabilities of these wheeled giants. In discussing their purpose, association general director L. Tatarinov says:

"Plans for the 11th Five-Year Plan period contemplated by the 26th party congress called for enormous amounts of earthmoving work to be done during the construction of hydraulic-engineering structures and the laying of transport and energy-carrying arterials. Unprecedented equipment is required for this purpose. Specially built machines, models of which our association has created, include a self-propelled scraper, a loader and a bulldozer...."

The scraper's bowl capacity is 25 cubic meters and its load capacity is 45 tons. This is the most powerful transport mechanism of this type in our country today. Two 550-hp engines have been installed on it. Top speed of the vehicle is up to 50 km/hr. When this scraper transports soil a distance of 1½ kilometer, it can haul 130-160 cubic meters of load in an hour.

The load capacity of the single-bucket loader is 15 tons. It can load large dump trucks at quarries and can itself haul loads. The vehicle was intended for work at construction projects and at open pits of the mining industry. It is especially effective for moving rock at distances of up to 1 km. One such loader successfully replaces 7 BelAZ's and an open-pit excavator.

The bulldozer, which has a rotatable blade, is equipped with a 550-hp engine. It was designed for a special wheeled chassis. It is, perhaps, best to use the vehicle for hauling soil over distances of 100-150 meters--here it is much more effective than a bulldozer on a crawler undercarriage. Future operating sites for the bulldozer are huge land-reclamation and industrial-construction projects.

And how are these giants controlled? Tests have shown that this does not provoke difficulties. On the scraper, for example, a powerful electrohydraulic system for

controlling the gearbox and the operating implement has been installed. The designers were concerned about good working conditions for the operator. The scraper's cab has reliable insulation against noise and heat, and two heaters have been installed.

It would not have been within the Dormash collective's capabilities to create the specially built machines. The Minskers collaborated actively with many enterprises. The Sverdlovsk Turbomotor Plant Association built specially a number of high-powered diesels. Machinebuilders of a Novokramatorsk plant machined the gears for the drive axles.

The Balakovo Self-Propelled Earthmoving Machinery Plant and the Berdyansk Road Machinery Plant will manufacture this equipment during the new five-year plan.

11409
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WORK TO DEVELOP MINING ROBOTS DESCRIBED

Moscow PRAVDA in Russian 30 Jan 81 p 2

[Article by Sh. Bolgozhin, director of the Mining Affairs Institute of the Kazakh SSR Academy of Sciences and corresponding member of the Kazakh SSR Academy of Sciences (Alma-Ata): "A Robot Miner Is Born"]

[Text] The Soviet state is concerned about improving the working conditions of wageworkers, including miners. In particular, the CPSU Central Committee's draft for the 26th party congress stipulates, "expand the creation and introduction of automated equipment for extracting coal at mines without the constant attendance of people at the breakage faces," and also, "develop the production and provide for the wide application of automatic manipulators (industrial robots)." The fulfillment of these tasks requires the active creative interaction of scientists, designers and producers.

The Kazakh SSR Institute of Mining Affairs is paying great attention to studying questions of the comprehensive mechanization and automation of production processes during underground and open-pit excavation of mineral deposits. Unfortunately, most of the automated equipment for breakage and drifting operations that have been designed have not reached the serial-output stage because of a lack of perfection of the recognition system--they are poor at distinguishing the edges of mineral deposits, because of which the adaptation of mining machines to operating conditions is impeded.

We see wider and more complete use of the achievements of engineering cybernetics and of industrial robotics as the way out of the situation. This approach is basically different from traditional methods for automating. It is based upon imitation of the functions of the human operator, who controls the equipment under complicated conditions. For example, the designing of special robots has been started at the institute with a view to raising drilling-work effectiveness. Use of the innovation promises to increase productivity severalfold and to save more than a million rubles per year at Dzhezkazgan ore mines alone. The sanitation and hygiene of working conditions also will be greatly improved, and the miners will be freed of difficult work.

One of the complicated problems is the creation of equipment and methods for excavating minerals without the presence of underground miners at the mine face

(unmanned excavation). In the case of coal deposits here, it is important to learn to control the behavior of the country rock, especially for the excavation of thin seams. The institute has developed for this purpose a set of pneumatic supports with remote control that can move in the space being excavated. The air that fills up the casing is light, lends itself to compression and does not require complicated devices for pumping. Such supports are flexible and are well adapted to the changing conditions of interaction with the block being mined. This is, in essence, a prototype for robots for controlling the rock pressure at breakage faces without people being present. Right now the pneumatic supports are being tested at the Abayskaya Underground Mine of the Karagandaugol' Association. They are being used for the maintenance of the transport tunnel as the longwall advances. The next step will be a test of full-scale models at breakage faces, and here we will require important assistance from the Karagandaugol' Association.

The breaking of hard rock by so-called surface current discharge is a promising method. This discharge occurs when an impulse of current of sufficient force is brought to the rock. So far we have created small-capacity generators, but more powerful ones are to be developed. Cutter-loaders equipped with such devices will be easy to design, but the main thing is that they will pave the way for full automation of the process of breaking hard rock, which is labor intensive and still is not very well controlled, and, according to calculations, they will reduce energy costs for destruction or breaking and crushing 3-fold to 4-fold.

In order to monitor operation of the self-propelled equipment, the institute has created and turned over to the client an automatic system of the "servo robot" type. It has successfully passed laboratory tests and industrial-model testing at the Dzhezkazgan Mining and Metallurgical Combine. Work is proceeding on a prototype of a loading-and-delivery robot with use of an Elektronika-60 computer.

The institute, jointly with other scientific-research and design institutions and production organizations, is designing automated mining-industry manipulators. A study is being conducted over a route that runs in the general direction of the mechanization and automation of underground mining work during the 11th and 12th five-year plans--unmanned excavation of minerals by means of industrial robots. In essence, we are talking about creating an automatic mining complex for excavating tough ores that is made up of a drilling-charging-blasting robot, a conveyor, an automated support deck, a robot for gobbing the excavated space, and a panel for controlling the complex in the tunnel. The engineering solutions being proposed are universal, are applicable in various mining-geology environments and will provide for practically complete safety of underground miners and the remote control of mining equipment.

Conversion to unmanned continuous excavation will enable labor productivity to be greatly increased (4-fold to 10-fold) over the best foreign mines, the prime cost of mining to be reduced appreciably, greater economic benefit to be obtained, and losses and dilution of ores to be reduced to the minimum.

An increase in the workload at such complexes will necessitate automation of their control systems. Our institute has gained definite experience in controlling mechanized mining complexes at underground coal mines by means of a computer. This experience will prove useful when establishing mines with a high degree of automation.

The institute has received the active support of the Kazakh SSR Academy of Sciences and the republic's Gosplan in developing and introducing automated manipulators. However, in considering the complexity of the problem and the numerous plans involved, an integrated program that involves specialized scientific-research and design-development institutes of a number of ministries and agencies and of manufacturing plants in its execution is necessary. In order to speed up the matter, it is desirable to have a coordinating center that has been granted wide plenary powers, including the financing of studies and the placement of orders for the manufacture of automatic manipulators in various branches of industry.

During the initial stage it is desirable to involve the Kazakh and Karaganda polytechnical institutes, Tyazhpromelektroproyekt [Institute for the Design of Electrical Equipment for Heavy Industry] of USSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work], the Special Design Bureau for Engineering Cybernetics under the Leningrad Polytechnical Institute, the Scientific-Research Institute for High Voltages under the Tomsk Polytechnical Institute, the association of the Kargormash machine-building plant, the Gorlovka Division of the Donetsk Scientific-Research Institute for Coal, the Karagandaugol' production association of USSR Minugleprom [Ministry of Coal Industry] and a number of other institutes, special design bureaus and manufacturing plants in the execution of the tasks. After completion of the research and design of automated manipulators and complexes for breakage work and industrial-test verification thereof, it will be possible to create systems for mining-industry robots, even for completely robotized mining enterprises. USSR Mintsvet [Ministry of Nonferrous Metallurgy] and Minchermet [Ministry of Ferrous Metallurgy] could be specified as the base ministries, in my opinion.

The Kazakh SSR's Institute of Mining Affairs has a definite backlog of accomplished work in developing the scientific bases for mining robotics and the creation of industrial automatic manipulators, and it is desirable to support the collective's efforts in this area: to allocate funds for the construction of a proving ground for testing experimental models and for the acquisition of machine tools and equipment, and to identify the design and development organization and the plant that will fabricate the test model of an automatic mining complex. It would be desirable that urgent tasks for developing the manufacture of mining robots be reflected in the CPSU Central Committee's draft for the 26th party congress.

11409
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METALWORKING EQUIPMENT

NEW ROLLING MILL ECONOMIZES METAL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Apr 81 p 2

[Article by Ye. Matveyev, deputy minister of heavy and transport machine building: "Do Not Cut But Roll Instead"]

[Text] Scientists and workers at VNIIMetmasha [All-Union Scientific Research Institute of Metalworking Machines] have pondered for a long time about obtaining machine building parts by a rolling method. I will not linger on the scientific and technical research, errors and findings. I will say only that a fundamentally new method of transverse, spiral and wedge-shaped rolling has been found and applied and special mills have been created. The parts and precision blanks that are obtained from them have minimum tolerances, are suitable for immediate finishing and in a number of cases do not even require it. In addition, the rolled parts that are obtained by a method of pliable warping come out with higher strength properties and are more durable.

Practically all of the parts of the type whose body rotates--from bicycle bushings to the axles of railroad cars--may be obtained from parts rolling mills. At the same time labor productivity is increased several times, from 12 to 30 percent of the metal is economized, the durable properties of the parts and blanks are increased on the average by a factor of 1.3 and the structural metal consumption of the machines is reduced. For example, the use of hollow railroad car axles that are obtained by a rolling method instead of traditional forging made it possible to lighten the undercarriage of a railroad car by 300 kilograms and the use of rolled drive gears in tractors and motor vehicles reduced the demand for spare parts by more than 20 percent.

At present 92 mills are in operation at various enterprises. Their use makes it possible to save more than 140,000 tons of metal annually. With the aid of them it was possible to free more than 8,000 metal cutting mills and 11,000 workers. This advanced piece of equipment has no analogue in worldwide practice.

Another innovation of machine builders is three-roller pressing mills for spiral rolling. With the aid of them machine building enterprises can produce small lots of round pieces of a needed diameter themselves from round or square rolled metal of one size. This already makes it possible to roll waste products of patterns with round or square cross-sections at the present time. And in the future this process can be combined with machines that do horizontal-type continuous casting which will significantly remove the load from metallurgy.

It would seem as if the advanced features, great economy and efficiency of the new technological processes of the new equipment have been completely proved in practice.

However, the adoption of parts rolling mills in industry is proceeding extremely slowly. What is the matter here?

First of all, inertia and the desire not to break with on-going production. As G. Gorban', steel founder at the "Azovstal'" plant, twice Hero of Socialist Labor and delegate to the 26th CPSU Congress justifiably noted in his letter, "From high quality steel to rolled metal and machines with the respected pentagon, administrators of many enterprises cannot overcome inertia and prefer to live according to the old ways. A multi-kilometer metal shaving continues to become a waste product." The situation is aggravated by mill builders who are not satisfying the demand for highly productive equipment for finishing rolled blanks with small tolerances of 0.2 to 0.6 mm.

Under these conditions many directors prefer mechanized or automated production of parts by a cutting method and on legitimate grounds turn metal into shavings. Even the Electric Steel Plant for heavy machine building, which produces the mills itself, used traditional technology employing cutting to obtain cogged clutches.

A second side of the problem is contained in the insufficient quantity of mills. It appears that in order to solve it the entire resources of all machine-building ministries are needed. The whole series of mills are sufficiently simple to produce that each plant, not to even mention the sector, can completely make them. Here I can state that this equipment was invented and is produced in the Ministry of Heavy Machine Building, the sector has trained personnel and specialized capabilities available; it, as they say, has even the maps in its hands.

At first glance everything is proper. But our enterprises turn out unique equipment on unique mills. To use them for producing small uncomplicated assemblies is, to a small degree, wasteful. Therefore, our plants must certainly make large mills, say, for the spiral rolling of railroad car axles.

9495
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MACHINE THAT WALKS BEING DEVELOPED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Apr 81 p 6

[Article by D. Pipko: "We are Teaching Robots to Walk"]

[Text] Within their circle scientists call this apparatus a "walker" without respect. Although they do see in it a prototype for those walking machines that go anyplace where there are no roads. On our planet or on another. Steep slopes, forest obstacles and rock deposits will not frighten such machines. If necessary they will even cross the rapids of mountain rivers on small logs and will get over the marshes of swamps along the tussocks. But the six-legged robot is walking only in the laboratory of the MGU [Moscow State University] Institute of Mechanics.

"To be completely accurate," says supervisor Ye. A. Devyanin, doctor of physical and mathematical sciences, "we are still only learning to walk."

What could be so difficult here? many ask. Millions of inhabitants of the planet, from the small insect to the mighty elephant, walk, gallop, run and tramp on their legs day after day demonstrating dozens of variations of walking. Any of them may be taken as an example and the problem will be solved. But....

Several years ago specialists in the American firm of "General Electric" built a walking platform with a cabin for a driver-operator. Positioned in it in a special suspended system he should have been able to control each of the four legs of the machine with the aid of two levers and two pedals. Candidates for operators trained long and tenaciously. But even the best of them were not able to master the control of it--literally after several steps they began to err.

"This failure forced us to conduct in-depth research," relates Ye. A. Devyanin, "and as a result to come to the conclusion: there is a kind of barrier which is not within the power of a person to overcome. It would seem as if he receives a wide "range" of movements as a gift from nature, a large portion of which he masters already in childhood before the age of five. But he masters them without thinking--on the unconscious level. And when the necessity arises of controlling the movements consciously then it becomes clear that a person can simultaneously carry out no more than two such movements."

Admittedly this explanation raised even more questions for me. Why did scientists, while creating the "walker," not decline to use the services of an operator? Why did

they leave it with not just four but six entire legs? Each one of them has three joints: one makes it possible for the leg to bend at the "knee," the second near the "hip" to go up and down, the third to step from place to place moving the leg in a circle like a compass leg. There is an electric motor on each joint. Eighteen in all. How can an operator keep them in his memory?

"That is not required of him," says the scientist. "The entire task consists of simplifying the control of it to the level of an 'automobile.' Or even to the level of the contact of a rider with his horse. What does this mean? The operator only gives a command of the type 'forward,' 'backward,' 'left,' 'faster,' 'turn in place.' And when this is done the legs move and the 'walker's' control system resolves it by itself."

The principles and algorithm of such a control system were worked out by scientists in the MGU Institute of Mechanics in collaboration with their colleagues from the Institute of Problems in Transmitting Information in the USSR Academy of Science headed by Doctor of Medical Sciences V. S. Gurfinkel. This research, which is being conducted under the scientific direction of D. Ye. Okhotsimskiy, member correspondent of the USSR AN [Academy of Sciences], in many ways predetermined the structural form of the "walker" as well. In particular, the choice of exactly six legs. What led scientists to such an approach?

First of all, the laws of statics. In order for an apparatus to be able to walk it must have a minimum of four legs. Then it will be able to maintain its stability on three of them and take a step with the fourth. But such an apparatus will move very slowly. And nature, seemingly knowing about this, solved the problem in its own way: it furnished all insects, for example, with six legs.

With such a number of legs it is now possible to alter the speed of movement and to employ different variations of walking. For example, when cockroaches run after prey or run from pursuit they employ the fastest gait using "three"--they immediately shift to three legs. Researchers adopted another principle from the centipede--the wave principle. And the "gallop" type of gait did not escape attention where the front, middle and back legs are shifted in pairs. Based on speed of movement the last variation is worse. But if it will be necessary to step over a log lying across a road or a deep crevice, it is impossible to get around without it.

"The 'walker' has gone quite a few kilometers already in the laboratory with supervisory control--by an operator's commands," continues Ye. A. Devyanin in the meantime. "and recently we decided to give it complete independence, having transformed it into a 'one hundred percent' robot. For this an 'eye' was installed on it--a system of technical vision."

The principle of operation for this system is simple: the "walker" sends out a light beam ahead scanning the space lying in front of it like a fan. The reflected signals, falling on a photographic receiver, report on the nature, direction and distance to obstacles.

Seeing how the "walker" confidently surmounts obstacles and easily maneuvers between them one could think that the problem of creating walking machines has already been solved. But Ye. A. Devyanin hurried to cool my ardor.

"There are quite a few problems for which there are still no answers. For example, we were able to reduce the electronic 'brain' of the apparatus to the dimensions of an average size suitcase. But the power "ran out" for the first design. Living creatures actively use the inertia of movements; they only turn on their muscles for work for a short period of time. And when we, for example, attempt to use the inertia of an automobile then we must disengage the wheels from the engine--otherwise it becomes a brake. Even this is impossible to do on a walking machine--the legs bend and it falls. And there are still quite a few of these problems."

Scientists are certainly mastering them as well. And in the meantime the "walker" became one of the heroes of the movie "Man and Robot" filmed at the "Lennauchfil'm" movie studio by producer L. M. Volkovyy. The film relates how industrial robots and the like are ever more frequently coming to the aid of man. And research and experiments with that same "walker" helps them to become more safe and perfect.

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